

WHAT IS CLAIMED IS:

1. A thin film transistor comprising:
 - a semiconductor film comprising crystalline silicon on an insulating surface;
 - a channel region comprising at least one silicon crystal formed in the semiconductor film;
 - source and drain regions in the semiconductor film with the channel region therebetween;
 - a gate electrode adjacent to the channel region,
 - wherein said silicon crystal has a [111] axis approximately parallel with said insulating surface.
2. The thin film transistor according to claim 1 wherein said channel region contains hydrogen.
3. The thin film transistor according to claim 1 wherein said channel region contains a catalyst element for promoting crystallization at a concentration not higher than 1×10^{19} atoms/cm³.
4. The thin film transistor according to claim 1 wherein said catalyst element is selected from the group consisting of nickel, palladium, platinum, copper, silver, gold, indium, tin, phosphorus, arsenic and antimony.
5. The thin film transistor according to claim 1 wherein said semiconductor film is formed over a glass substrate.
6. A thin film transistor comprising:
 - a semiconductor film comprising crystalline silicon on an insulating surface;
 - a channel region comprising at least one silicon crystal formed in the semiconductor film wherein said silicon crystal extends in parallel with the insulating surface;
 - source and drain regions in the semiconductor film with the channel region therebetween;
 - a gate electrode adjacent to the channel region,

wherein said silicon crystal has a [111] axis approximately parallel with said insulating surface.

7. The thin film transistor according to claim 6 wherein said channel region contains hydrogen.

8. The thin film transistor according to claim 6 wherein said channel region contains a catalyst element for promoting crystallization at a concentration not higher than 1×10^{19} atoms/cm³.

9. The thin film transistor according to claim 6 wherein said catalyst element is selected from the group consisting of nickel, palladium, platinum, copper, silver, gold, indium, tin, phosphorus, arsenic and antimony.

10. The thin film transistor according to claim 6 wherein said semiconductor film is formed over a glass substrate.

11. A thin film transistor comprising:
a semiconductor film comprising crystalline silicon on an insulating surface;
a channel region comprising at least one silicon crystal formed in the semiconductor film;
source and drain regions in the semiconductor film with the channel region therebetween;
a gate electrode adjacent to the channel region,
wherein said silicon crystal has a [111] axis approximately parallel with said insulating surface, and
wherein said silicon crystal has at least one of {110}, {123}, {134}, {235}, {145}, {156}, {257} and {167}.

12. The thin film transistor according to claim 11 wherein said channel region contains hydrogen.

13. The thin film transistor according to claim 11 wherein said channel region contains a catalyst element for promoting crystallization at a concentration not higher than 1×10^{19} atoms/cm³.

14. The thin film transistor according to claim 11 wherein said catalyst element is selected from the group consisting of nickel, palladium, platinum, copper, silver, gold, indium, tin, phosphorus, arsenic and antimony.

15. The thin film transistor according to claim 11 wherein said semiconductor film is formed over a glass substrate.

16. A thin film transistor comprising:
a semiconductor film comprising crystalline silicon on an insulating surface;
a channel region comprising at least one silicon crystal formed in the semiconductor film wherein said silicon crystal extends in parallel with the insulating surface;
source and drain regions in the semiconductor film with the channel region therebetween;
a gate electrode adjacent to the channel region,
wherein said silicon crystal has a [111] axis approximately parallel with said insulating surface, and
wherein said silicon crystal has at least one of {110}, {123}, {134}, {235}, {145}, {156}, {257} and {167}.

17. The thin film transistor according to claim 16 wherein said channel region contains hydrogen.

18. The thin film transistor according to claim 16 wherein said channel region contains a catalyst element for promoting crystallization at a concentration not higher than 1×10^{19} atoms/cm³.

19. The thin film transistor according to claim 16 wherein said catalyst element is selected from the group consisting of nickel, palladium, platinum, copper, silver, gold, indium, tin, phosphorus, arsenic and antimony.

20. The thin film transistor according to claim 16 wherein said semiconductor film is formed over a glass substrate.